member **30** is at a distance from the vibration line of force **76** of less than 10% of the distance between the center of mass **90** and the center of mass **93**. For example, if the distance between the center of mass **90** and the center of mass **93** is twenty inches, than the offset distance between the center of mass **90** and the line **76** should be less than two inches.

Applicant has also found that the versatility of the apparatus is enhanced when the weight of the excited frame means **13** is between 1.5 and 3.5 times the weight of the conveyor member **30**. Preferably the ratio of the weight of the excited frame means **13** and the conveyor member **30** should be between 2.5 and 3.5. For example if the weight of the conveyor member is 350 lbs., the excited frame means should be between 850 lbs. and 1,250 lbs.

Additionally applicant has found that improved results may be obtained when the mounts **26, 28** are mounted equal distance in a horizontal direction from the center of mass **95** of the assembly. Such feature additionally decreases rocking motion of the ends **32** and **33** and also decreases rolling motion.

During the operation of the apparatus **10**, the conveyor member **30** is vibrated near its natural frequency with the material progressively moving from the rear end **33** to the front end **32**. Because of the vibratory movement of the particulate material, the applicant has found that only approximately one-third of the weight of the particulate material should be included in the calculations of the loaded center of mass **91** of the elongated conveyor means **30**. Consequently, the center of mass **91** is calculated by utilizing the weight and distribution of the conveyor means **30** and one-half of the weight of the spring assemblies **94** and approximately one-third of the design or maximum particulate material load.

Additionally, the applicant has found that, with the alignment of the vibratory drive means **70** with respect to the center of masses, the stroke of the conveying member may be easily controlled by the rpm of the vibratory drive **70**. Consequently it is relatively easy to adjust the stroke of the apparatus merely by changing the speed of rotation of the vibratory drive means **70**.

FIGS. **1–5** illustrate a floor mounted arrangement. FIGS. **6–7** show an elevated or ceiling mounted arrangement in which the air/rubber mounts **26, 28** are supported on a bracket **101** that is suspended from a rod **102**. Consequently, the applicant's invention is quite versatile because of its ability to accurately and efficiently convey the particulate material without transmitting any appreciable vibration to the stationary supporting structure.

These and other embodiments may be readily devised by those skilled in the art without deviating therefrom. Therefore, only the following claims are intended to define or limit the applicant's invention.

What is claimed is:

**1**. An excited frame, vibratory conveying apparatus for moving particulate material, comprising:

an excited frame means having an elongated frame extending in an intended conveying direction defining a first part of an assembly;

said excited frame means having a known center of mass;

an elongated conveying member supported on the elongated frame and extending in the intended conveying direction and defining a second part of the assembly for receiving particulate material at one end and conveying the particulate material in a forward direction to an opposite end;

said elongated conveying member having a known center of mass;

first supporting means for resiliently supporting the conveying member on the excited frame means and defining a third part of the assembly to enable the elongated conveying member to reciprocate in the intended conveying direction with respect to the elongated frame;

said first supporting means comprising a plurality of springs connected to and extending between the elongated frame and the conveying member for resiliently supporting the conveying member on the elongated frame to enable the conveying member on the elongated frame to enable the conveying member to reciprocate in a prescribed path in the intended conveying direction with the conveying member forward and upward in a forward stroke and rearward and downward in a rearward stroke with respect to the excited frame means;

said springs having a known spring constant and wherein said assembly has a known weight and center of mass;

a second supporting means for resiliently supporting the excited frame means;

said excited frame means having a directional vibratory drive means mounted thereon and directly connected to the elongated frame in which the directional vibratory drive means produces vibrating motion along a linear line of force for directly vibrating the elongated frame at a desired frequency relating to the weight of the assembly and spring constant;

said excited frame means having a mounting means mounting the vibratory drive means on the elongated frame with the linear line of force extending colinearly through the center of masses of the excited frame means and the conveying member and parallel with the prescribed reciprocating path of the conveying member to minimize rocking motion of the conveying element about its center of mass; and

said vibratory drive means being mounted along the line of force spaced from the center of mass of the assembly.

**2**. The vibratory conveying apparatus as defined in claim **1** wherein the excited frame means and the conveying member have known weights and wherein the ratio of the weight of the excited frame means to the weight of the conveying member is between 1.5 and 3.5.

**3**. The vibratory conveying apparatus as defined in claim **1** wherein the second supporting means includes a plurality of spaced resilient frame mounts in which the mounts are horizontally equally spaced from the center of mass of the assembly.

**4**. The vibratory conveying apparatus as defined in claim **2** wherein the ratio of the weight of the excited frame means to the weight of the conveying member is between 2.5 and 3.5.

**5**. The vibratory conveying apparatus as defined in claim **1** wherein the first supporting means comprises a plurality of parallel beam springs in which each of the beam springs is inclined and faces the intended conveying direction and wherein the linear line of force extends normal to the parallel beam springs.

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